SERVICE MANUAL SQA-1

marantz

model SQA-1

SQ ADAPTOR

marantz

TABLE OF CONTENTS

SECTION	PAGE
Introduction	1
Service Notes	1
Circuit Description	1
Trouble Analysis	3
Test Equipment Required for Servicing	5
Parts List	8
Technical Specifications	12

LIST OF ILLUSTRATIONS

FIGURE NO.		PAGE
1.	Functional Block Diagram	2
2.	Signals at Point E.F.G. and H.	2
3.	Component Locations (Top View)	5
4.	Printed Circuit Board Component Locations	6
5.	Schematic Diagram	7

1. INTRODUCTION

This service manual was prepared for use by Authorized Warranty Stations and contains service information for Marantz Model SQA-1 SQ Adaptor.

Servicing information and voltage data included in this manual are intended for use by the knowledgeable and experienced technician only. All instruction should be read carefully. No atempt should be made to proceed without a good understanding of the operation in the circuits.

The parts lists furnish information by which replacement part may be ordered from the Marantz Company. A simple description is included for parts which can usually be obtained through local suppliers.

2. SERVICE NOTES

The Model SQA-1 Decoder reproduces four channel sounds from phonograph records processed by Columbia's stereo-quadraphonic encoding system. (CBS SQ System). In this system the SQ record is produced by mixing 4-channel stereophonic sound signals from a 4-channel master tape into a 2-channel signal through a matrix encorder. When the record is played on a regular stereophonic player excellent stereo sound is obtained. When the SQ record is played back by a 4-channel playback system with the SQ decoder, the resulting 4-channel sound is virtually indistinguishable from the original master tape. The recorded sound can be broadcasted through the FM multiplex system and decoded into 4-channel sound through a receiver equipped with an SQ decoder.

The Model SQA-1 includes the front-rear logic circuit which enhances front-to-rear channel separation.

The Model SQA-1 is specifically designed for plug-in use with Marantz 4-channel audio components (Models 4415, 4430, 4100, 4060, 2440, etc.). The adaptor, is easily installed on the underside of the master unit. It should be noted that the Model SQA-1 is specifically designed for certain Marantz 4-channel components only. Marantz is not responsible for any damage resulting from any attempt to connect the SQA-1 to any audio component for which the SQA-1 was not specifically designed.

3. CIRCUIT DESCRIPTION

Symbols L_T and R_T employed here indicate the SQ encoded right and left 2-channel input signals, respectively. These 2-channel signals are decoded into 4-channel signals: LF (left front), RF (right front), LR (left rear), and RR (right rear). As can be seen from Figure 1, the Model SQA-1 circuit is made up of phase shifters, matrix, output amplifiers, and front-rear logic circuit.

3.1 Phase Shifter

The Model SQA-1 incorporates four sets of phase shifter, each of which contains two transistors. When signal L_T passes through two sets of phase shifter, output signals at points Ⓐ and Ⓑ maintain approximately 90 degrees phase difference throughout the entire audio spectrum, with the signal at point Ⓐ leading the one at point Ⓑ. Signal R_T is processed in a similar phase relationship to signal L_T since the output signals at point Ⓓ and Ⓒ are the same as at points Ⓐ and Ⓑ, respectively. Let the output signal phase at points Ⓐ and Ⓓ be φ −0 degrees as the reference phase. Then, the output signal phase at points Ⓑ and Ⓒ can be written as φ −90 degrees. If input signal L_T and output signal at point Ⓐ are compared, the phase relationship will changes from 0 to 360 degrees on variation of frequency. It should be noted that this comparison is of no value.

3.2 Matrix

The matrix is comprised of R149, R150, R151, and R152. Signals L_T (φ −90 degrees) and R_T (φ −0 degree) are decreased by 3dB before being added and applied to point Ⓧ, resulting in

0dB as the total input level. In a similar manner, the signals L_T (φ –0 degree) and R_T (φ–90 degrees) are applied to point Ⓨ. The resultant signal at point Ⓧ is further phase inverted through H109. The vector relationship of processed output signals at points Ⓔ, Ⓕ, Ⓖ, and Ⓗ is illustrated in Figure 2.

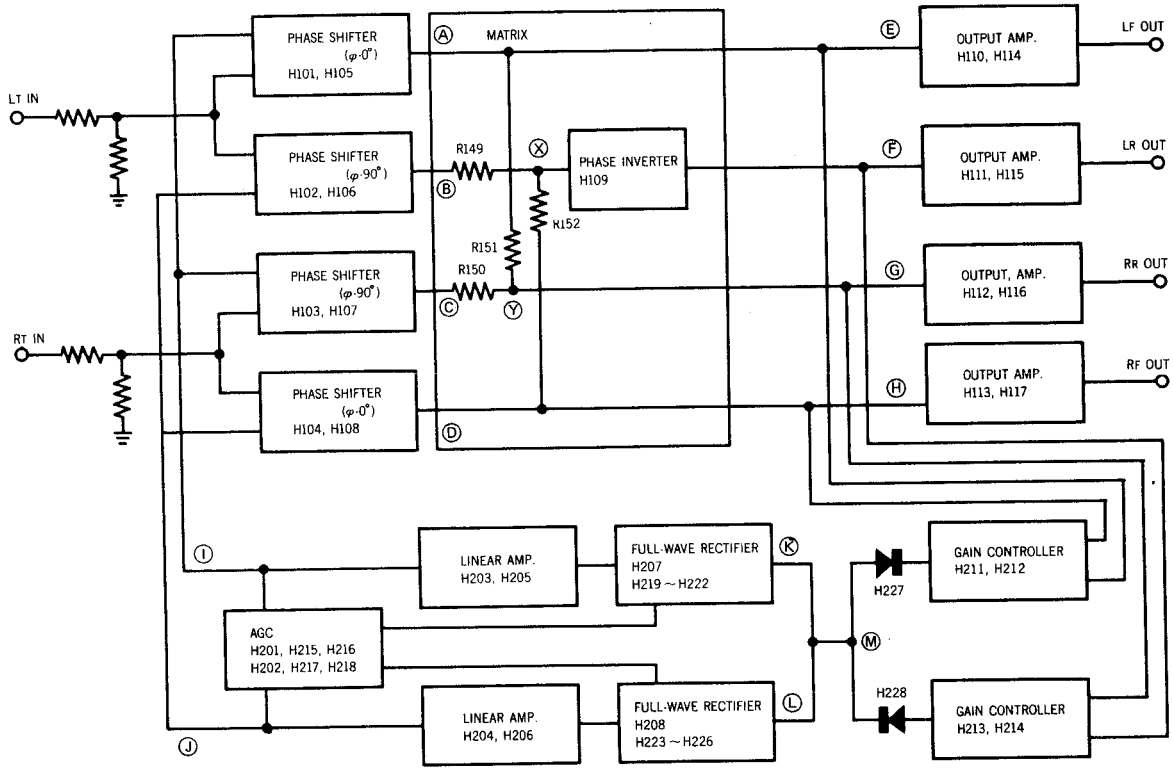


Figure 1. Functional Block Diagram

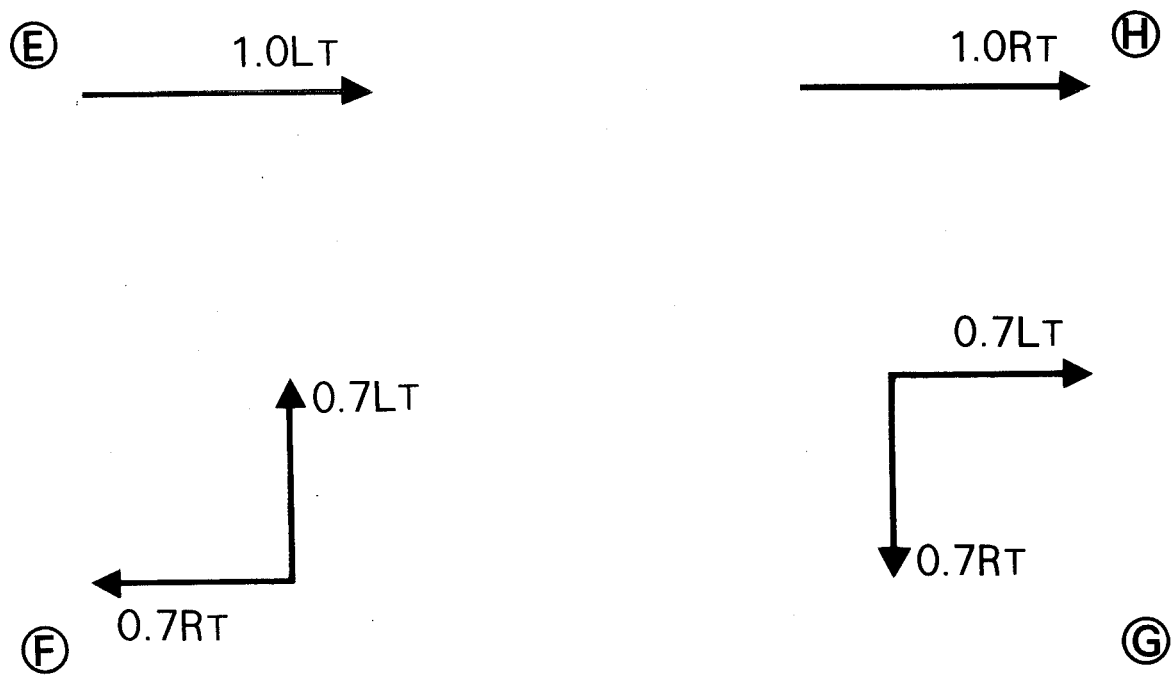


Figure 2. Signals at Point E,F,G and H

3.3 Output Amplifier

The Model SQA-1 incorporates four sets of output amplifiers, each of which consists of two transistors. Each is designed as an NPN-PNP direct-coupled amplifier, which provides high input impedance and low output impedance. The gain from the input to output is controlled to 0dB, that is, the total gain of the SQ decoder is unity (0dB).

The above-mentioned phase shifters, matrix, and output amplifiers are basic configuration required for SQ decoding function. In addition to these essential provisions, the Model SQA-1 incorporates the front-rear logic circuit for improved front-to-rear channel separation.

3.4 Front-Rear Logic Circuit

Input signals to the front-rear logic circuit are $R_T - L_T$ at point Ⓘ and $R_T + L_T$ at point Ⓙ. Each signal is amplified through an NPN-NPN direct-coupled linear amplifier stage and is rectified through the succeeding full-wave rectifier into a DC voltage. The DC voltage appears at points Ⓚ and Ⓛ in proportion to the input AC signal levels, respectively, and are added at point Ⓜ.

The DC voltage appearing at point Ⓜ will be discussed below. If only signal L_T (or R_T) is applied to the circuit, signal $-L_T$ (or R_T) appears at point Ⓘ and L_T (or R_T) at point Ⓙ. After the signals are full wave rectified, a positive DC voltage is fed to point Ⓚ, and a negative DC voltage to point Ⓛ, with the absolute values of both voltages being identical. This results in 0 V at point Ⓜ. In turn, if the input signal is related as $L_T = R_T$, that is, sound source positioning at front center in the original sound field, no signal is delivered to point Ⓘ, and the signal at point Ⓙ is $2L_T$. This leads to a 0V DC voltage at point Ⓚ and a negative DC voltage at point Ⓛ, with the latter voltage appearing directly at point Ⓜ. Similarly, if the input signal is related as $L_T = -R_T$, that is, sound source positioning at rear center in the original sound field, a positive DC voltage appears at point Ⓜ.

Diode H227 passes the resultant positive DC voltage, thereby turning on transistors H211 and H212, connected to the RF and LF channels, respectively. H211 and H212, when turned on, decrease the emitter-collector resistance, thereby decreasing the signals fed the output amplifiers H113 and H117, and H110 and H114. Resistor R245 placed in the switching circuit causes crosstalk between the RF and LF channels.

With the above mentioned process the front-rear logic circuit completes its operational function, that is, when a sound signal to be positioned at the rear center is applied to the circuit, it decreases the RF and LF channel gains by approximately 10dB.

Similar functions apply to the operation of transistors H213 and H214, which are turned on by the negative DC voltage at point Ⓜ.

The AGC circuit permits the front-rear logic circuit to function securely irrespective of the input signal strength as outlined below. The AC signals from the emitters of transistors H207 and H208 are separately rectified into DC voltage, which are mixed together and fed back to the bases of H201 and H202. H201 and H202 change collector-emitter resistance with variation of base biasing voltage, thereby the input signals to H203 and H204 are controlled. The AGC circuit functions with either signal $R_T - L_T$ or $R_T + L_T$ or both.

4. TROUBLE ANALYSIS

For any symptom, first check the total current drain, which is approximately 45mA under normal operating condition. For easy and quick trouble shooting, it is advisable to check each functional performance of the phase shifter and matrix circuit, and the front-rear logic circuit.

4.1 Phase Shifter and Matrix Circuit

By shortcircuiting the junction of R235, R236, H227, and H228 to the junction of R233, R234, C221, and C222 (+15.6V line), the front-rear logic circuit can be silenced. Check each channel output in respect to the input signals listed in the Table 1 and compare them with those shown in the table. No notable difference shows no trouble in the phase shifter and matrix circuit. If any, check signal routing of the corresponding channel.

INPUT		OUTPUT				
			LF	LR	RF	RR
LT only	150mV, 1KHz	dB	0 ± 1	−3 ± 1	≤-20	−3 ± 1
LT = RT (−90°)	106mW, 1KHz	dB	−3 ± 1	0 ± 1	−3 ± 1	≤ −20
RT only	150mV, 1KHz	dB	≤ −20	−3 ± 1	0 ± 1	−3 ± 1
LT = RT (+90°)	106mV, 1KHz	db	−3 ± 1	≤ −20	−3 ± 1	0 ± 1
LT = RT	150mV, 1KHz	dB	0 ± 1	0 ± 1	0 ± 1	0 ± 1
LT = RT (180°)	150mV, 1KHz	dB	0 ± 1	0 ± 1	0 ± 1	0 ± 1

Note. LT = RT (−90°) indicates that L_T signal leads R_T signal by 90 degree in phase relationship.

Table 1. Basic Matrix Characteristics

4.2 Front-Rear Logic Circuit

This circuit functions under the following conditions.

Frequency: 80Hz to 15KHz

Input signal voltage: 10mV to 8V

Input voltage difference between L_T and R_T: Within 6dB approx.

With operation of the front-rear logic circuit, the output signal level decreases by 8±2dB from the reference level.

If the circuit operates outside the above mentioned conditions, with only signal L_T applied, for example, check for unbalanced transistors H201 and H202. When replacing, these two transistors must be replaced in pair.

INPUT		OUTPUT				
			LF	LR	RF	RR
LT only	150mV, 1KHz	dB	0 ± 1	−3 ± 1	≤ −20	−3 ± 1
LT = RT (−90°)	106mV, 1KHz	dB	−3 ± 1	0 ± 1	−3 ± 1	≤ −20
RT only	150mV, 1KHz	dB	≤ −20	−3 ± 1	0 ± 1	−3 ± 1
LT = RT (+90°)	106mV, 1KHz	dB	−3 ± 1	≤ −20	−3 ± 1	0 ± 1
LT = RT	150mV, 1KHz	dB	0 ± 1	≤ −7	0 ± 1	≤ −7
LT = RT (180°)	150mV, 1KHz	dB	≤ −6	0 ± 1	≤ − 6	0 ± 1

Table 2. Front–Rear Logic Characteristics

5. Test Equipment Required for Servicing

Table 3 lists the test equipment required for servicing the Model SQA-1 SQ Adaptor.

Item	Manufacturer and Model No. (or equivalent)	Use
Distortion Analyzer	Hewlett Packard, Model 331A or 333A	Measures distortion and output signal level.
Audio Oscillator	Weston, Model CVO-100P	Sinewave signal source.
VTVM	RCA Senior Volt-Ohmyst, Model WV-98C	Voltage and resistance measurements.
Oscilloscope	Tektronix, Model 503; Data, Model 555	Waveform analysis and trouble shooting.
Regulated D.C. Power Supply (35V 0.5A)		Power source
D.C. Voltmeter (0 to 50V)	Commercial Grade	Line voltage measurement
D.C. Ammeter (0 to 100mA)	Commercial Grade	Current drain measurement.
Output Load Resistor (100K ohm ±0.5% 1/2W)	Commercial Grade	Output termination.
SQ Encoder		Signal encoding.
Phase Meter		Signal phase measurement.

Table 3 Test Equipment Required for Servicing

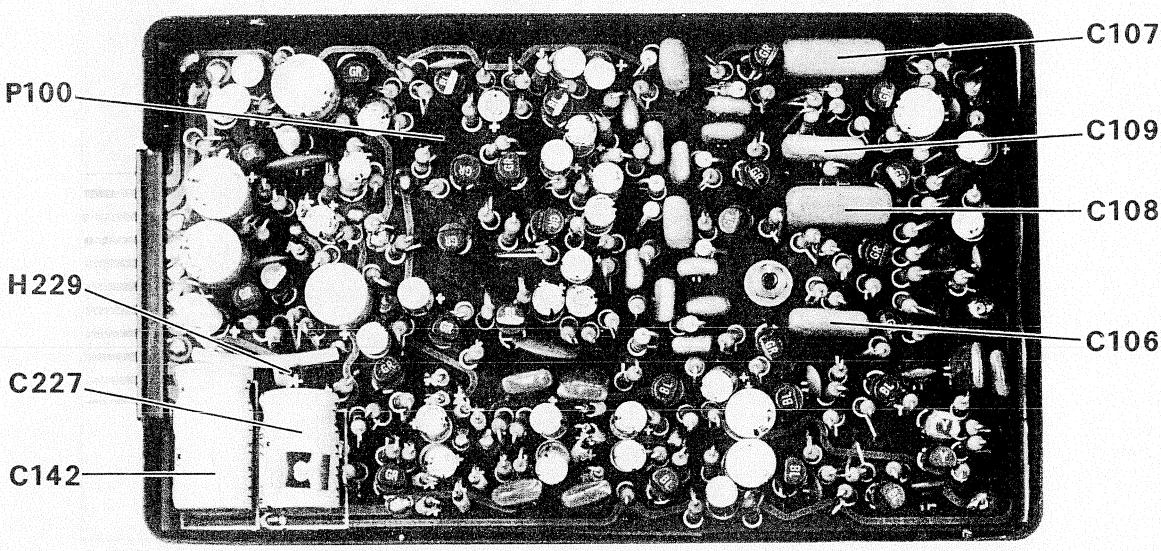


Figure 3. Component Locations (Top View)

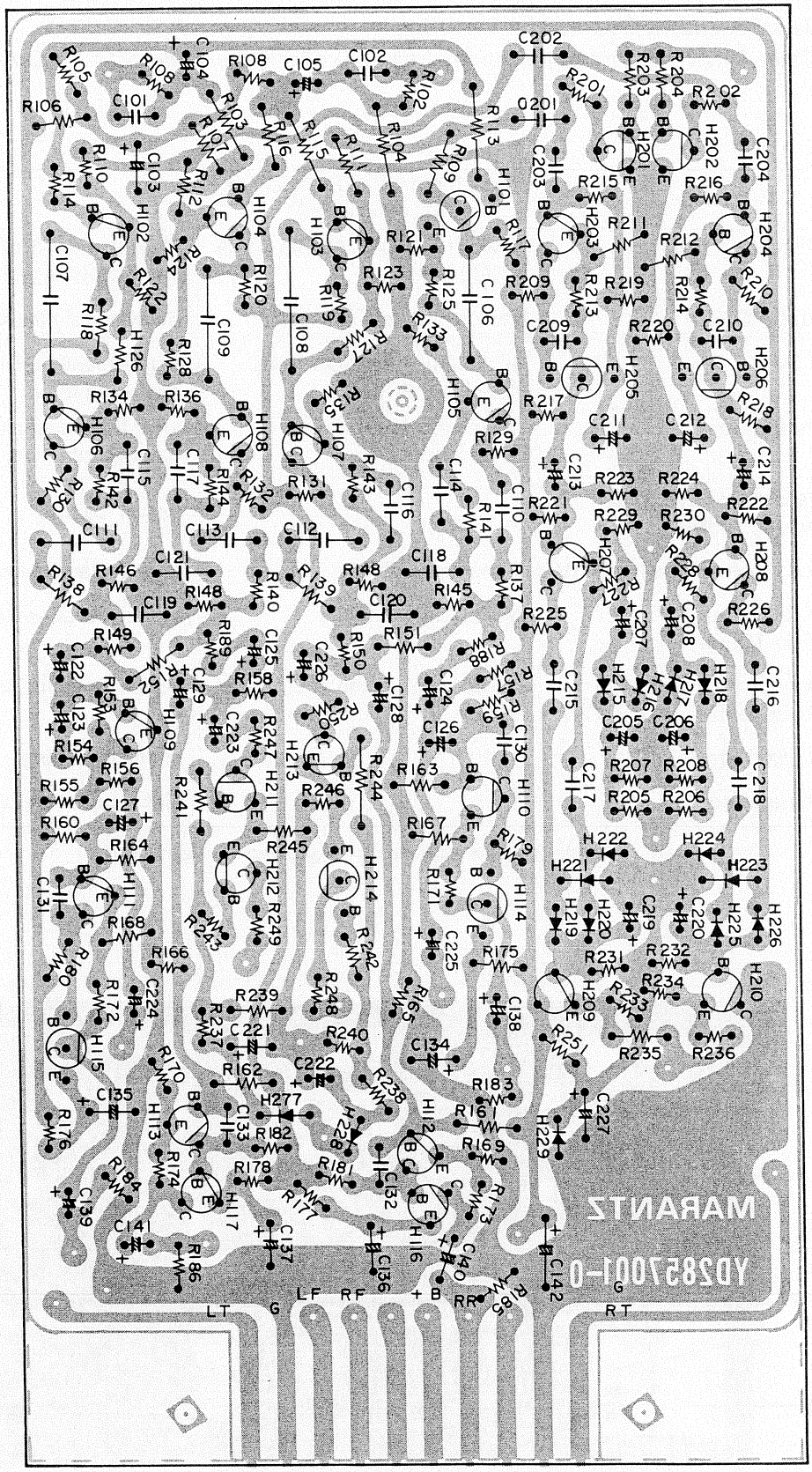
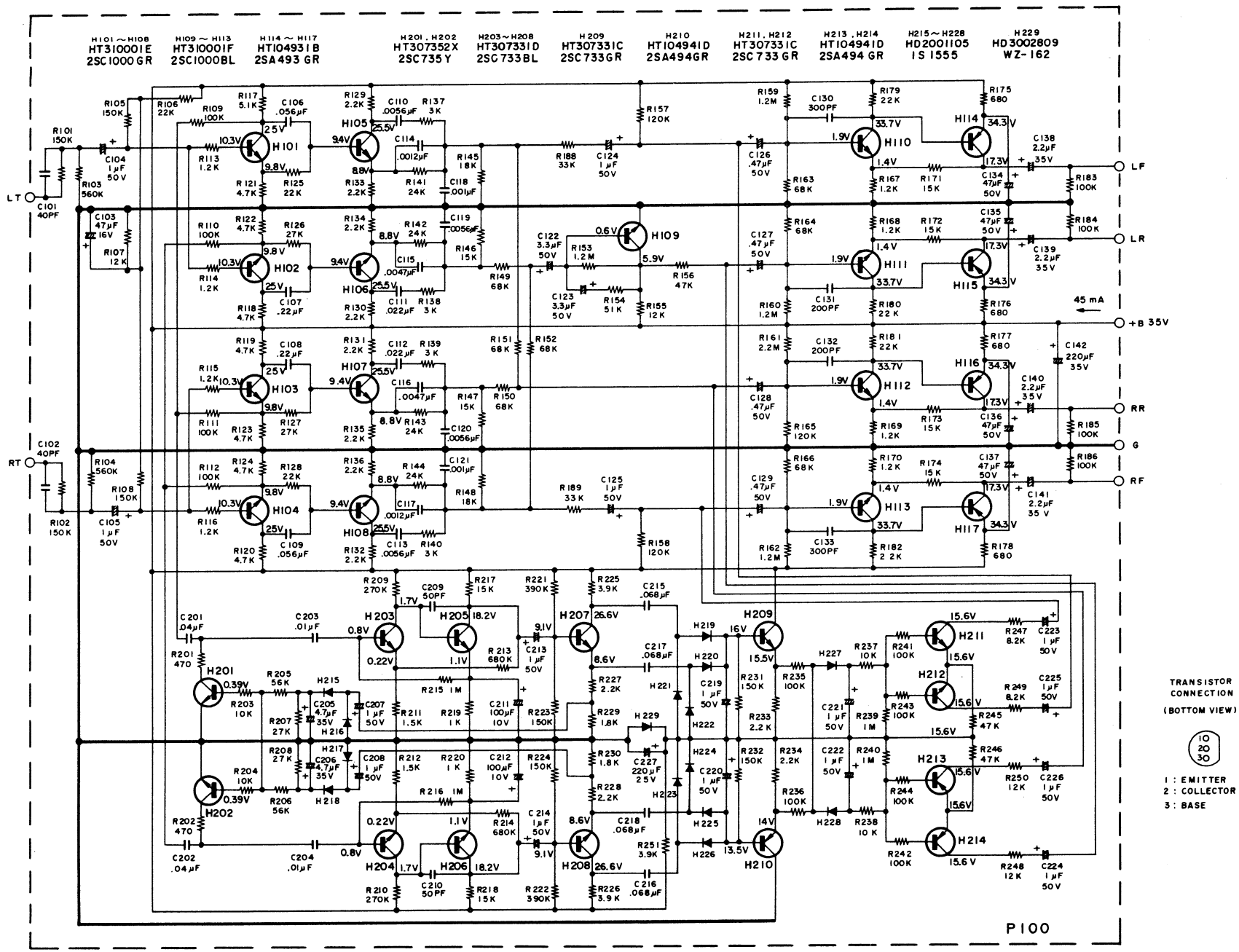


Figure 4. Printed Circuit Board Component Locations



TRANSISTOR CONNECTION (BOTTOM VIEW)

1 : EMITTER
2 : COLLECTOR
3 : BASE

Figure 5. Schematic Diagram

6. PARTS LIST

REF. DESIG.	MARANTZ PART NO.	DESCRIPTION
P100	YD2857001	P. C. Board
	ZZ2857001	P. C. Board Ass'y
		RESISTORS
R101	RT0515414	150KΩ ¼W ±5%
R102	RT0515414	150KΩ ¼W ±5%
R103	RT0556414	560KΩ ¼W ±5%
R104	RT0556414	560KΩ ¼W ±5%
R105	RT0515414	150KΩ ¼W ±5%
R106	RT0522314	22KΩ ¼W ±5%
R107	RT0512314	12KΩ ¼W ±5%
R108	RT0515414	150KΩ ¼W ±5%
R109	RT0510414	100KΩ ¼W ±5%
R110	RT0510414	100KΩ ¼W ±5%
R111	RT0510414	100KΩ ¼W ±5%
R112	RT0510414	100KΩ ¼W ±5%
R113	RT0512214	1.2KΩ ¼W ±5%
R114	RT0512214	1.2KΩ ¼W ±5%
R115	RT0512214	1.2KΩ ¼W ±5%
R116	RT0512214	1.2KΩ ¼W ±5%
R117	RT0551214	5.1KΩ ¼W ±5%
R118	RT0547214	4.7KΩ ¼W ±5%
R119	RT0547214	4.7KΩ ¼W ±5%
R120	RT0547214	4.7KΩ ¼W ±5%
R121	RT0547214	4.7KΩ ¼W ±5%
R122	RT0547214	4.7KΩ ¼W ±5%
R123	RT0547214	4.7KΩ ¼W ±5%
R124	RT0547214	4.7KΩ ¼W ±5%
R125	RT0522314	22KΩ ¼W ±5%
R126	RT0527314	27KΩ ¼W ±5%
R127	RT0527314	27KΩ ¼W ±5%
R128	RT0522314	22KΩ ¼W ±5%
R129	RT0522214	2.2KΩ ¼W ±5%
R130	RT0522214	2.2KΩ ¼W ±5%
R131	RT0522214	2.2KΩ ¼W ±5%
R132	RT0522214	2.2KΩ ¼W ±5%
R133	RT0522214	2.2KΩ ¼W ±5%
R134	RT0522214	2.2KΩ ¼W ±5%
R135	RT0522214	2.2KΩ ¼W ±5%
R136	RT0522214	2.2KΩ ¼W ±5%
R137	RT0530214	3KΩ ¼W ±5%
R138	RT0530214	3KΩ ¼W ±5%
R139	RT0530214	3KΩ ¼W ±5%
R140	RT0530214	3KΩ ¼W ±5%
R141	RT0524314	24KΩ ¼W ±5%
R142	RT0524314	24KΩ ¼W ±5%
R143	RT0524314	24KΩ ¼W ±5%
R144	RT0524314	24KΩ ¼W ±5%
R145	RT0518314	18KΩ ¼W ±5%
R146	RT0515314	15KΩ ¼W ±5%

REF. DESIG.	MARANTZ PART NO.	DESCRIPTION
R147	RT0515314	15KΩ ¼W ±5%
R148	RT0518314	18KΩ ¼W ±5%
R149	RT0568314	68KΩ ¼W ±5%
R150	RT0568314	68KΩ ¼W ±5%
R151	RT0568314	68KΩ ¼W ±5%
R152	RT0568314	68KΩ ¼W ±5%
R153	RT0512514	1.2MΩ ¼W ±5%
R154	RT0551314	51KΩ ¼W ±5%
R155	RT0512314	12KΩ ¼W ±5%
R156	RT0547314	47KΩ ¼W ±5%
R157	RT0512414	120KΩ ¼W ±5%
R158	RT0512414	120KΩ ¼W ±5%
R159	RT0512514	1.2MΩ ¼W ±5%
R160	RT0512514	1.2MΩ ¼W ±5%
R161	RT0522514	2.2MΩ ¼W ±5%
R162	RT0512514	1.2MΩ ¼W ±5%
R163	RT0568314	68KΩ ¼W ±5%
R164	RT0568314	68KΩ ¼W ±5%
R165	RT0512414	120KΩ ¼W ±5%
R166	RT0568314	68KΩ ¼W ±5%
R167	RT0512214	1.2KΩ ¼W ±5%
R168	RT0512214	1.2KΩ ¼W ±5%
R169	RT0512214	1.2KΩ ¼W ±5%
R170	RT0512214	1.2KΩ ¼W ±5%
R171	RT0515314	15KΩ ¼W ±5%
R172	RT0515314	15KΩ ¼W ±5%
R173	RT0515314	15KΩ ¼W ±5%
R174	RT0515314	15KΩ ¼W ±5%
R175	RT0568114	680Ω ¼W ±5%
R176	RT0568114	680Ω ¼W ±5%
R177	RT0568114	680Ω ¼W ±5%
R178	RT0568114	680Ω ¼W ±5%
R179	RT0522314	22KΩ ¼W ±5%
R180	RT0522314	22KΩ ¼W ±5%
R181	RT0522314	22KΩ ¼W ±5%
R182	RT0522314	22KΩ ¼W ±5%
R183	RT0510414	100KΩ ¼W ±5%
R184	RT0510414	100KΩ ¼W ±5%
R185	RT0510414	100KΩ ¼W ±5%
R186	RT0510414	100KΩ ¼W ±5%
R188	RT0533314	33KΩ ¼W ±5%
R189	RT0533314	33KΩ ¼W ±5%
R201	RT0547114	470Ω ¼W ±5%
R202	RT0547114	470Ω ¼W ±5%
R203	RT0510314	10KΩ ¼W ±5%
R204	RT0510314	10KΩ ¼W ±5%
R205	RT0556314	56KΩ ¼W ±5%
R206	RT0556314	56KΩ ¼W ±5%
R207	RT0527314	27KΩ ¼W ±5%
R208	RT0527314	27KΩ ¼W ±5%

REF. DESIG.	MARANTZ PART NO.	DESCRIPTION
R209	RT0527414	270KΩ ¼W ±5%
R210	RT0527414	270KΩ ¼W ±5%
R211	RT0515214	1.5KΩ ¼W ±5%
R212	RT0515214	1.5KΩ ¼W ±5%
R213	RT0568414	680KΩ ¼W ±5%
R214	RT0568414	680KΩ ¼W ±5%
R215	RT0510514	1MΩ ¼W ±5%
R216	RT0510514	1MΩ ¼W ±5%
R217	RT0515314	15KΩ ¼W ±5%
R218	RT0515314	15KΩ ¼W ±5%
R219	RT0510214	1KΩ ¼W ±5%
R220	RT0510214	1KΩ ¼W ±5%
R221	RT0539414	390KΩ ¼W ±5%
R222	RT0539414	390KΩ ¼W ±5%
R223	RT0515414	150KΩ ¼W ±5%
R224	RT0515414	150KΩ ¼W ±5%
R225	RT0539214	3.9KΩ ¼W ±5%
R226	RT0539214	3.9KΩ ¼W ±5%
R227	RT0522214	2.2KΩ ¼W ±5%
R228	RT0522214	2.2KΩ ¼W ±5%
R229	RT0518214	1.8KΩ ¼W ±5%
R230	RT0518214	1.8KΩ ¼W ±5%
R231	RT0515414	150KΩ ¼W ±5%
R232	RT0515414	150KΩ ¼W ±5%
R233	RT0522214	2.2KΩ ¼W ±5%
R234	RT0522214	2.2KΩ ¼W ±5%
R235	RT0510414	100KΩ ¼W ±5%
R236	RT0510414	100KΩ ¼W ±5%
R237	RT0510314	10KΩ ¼W ±5%
R238	RT0510314	10KΩ ¼W ±5%
R239	RT0510514	1MΩ ¼W ±5%
R240	RT0510514	1MΩ ¼W ±5%
R241	RT0510414	100KΩ ¼W ±5%
R242	RT0510414	100KΩ ¼W ±5%
R243	RT0510414	100KΩ ¼W ±5%
R244	RT0510414	100KΩ ¼W ±5%
R245	RT0547314	47KΩ ¼W ±5%
R246	RT0547314	47KΩ ¼W ±5%
R247	RT0582214	8.2KΩ ¼W ±5%
R248	RT0512314	12KΩ ¼W ±5%
R249	RT0582214	8.2KΩ ¼W ±5%
R250	RT0512314	12KΩ ¼W ±5%
R251	RT0539214	3.9KΩ ¼W ±5%
		CAPACITORS
C101	DD1540001	Ceramic 40PF ±5% 50V
C102	DD1540001	Ceramic 40PF ±5% 50V
C103	EA4760169	Electroly 47μF +100% -10 16V
C104	EA1050509	Electroly 1μF +100% -10 50V

REF. DESIG.	MARANTZ PART NO.	DESCRIPTION
C105	EA1050509	Electroly 1μF +100% -10 50V
C106	DF1556305	Film 0.056μF ±5% 50V
C107	DF1622405	Film 0.22μF ±10% 50V
C108	DF1622405	Film 0.22μF ±10% 50V
C109	DF1556305	Film 0.056μF ±5% 50V
C110	DF1556205	Film 0.0056μF ±5% 50V
C111	DF1522305	Film 0.022μF ±5% 50V
C112	DF1522305	Film 0.022μF ±5% 50V
C113	DF1556205	Film 0.0056μF ±5% 50V
C114	DF1512205	Film 0.0012μF ±5% 50V
C115	DF1547205	Film 0.0047μF ±5% 50V
C116	DF1547205	Film 0.0047μF ±5% 50V
C117	DF1512205	Film 0.0012μF ±5% 50V
C118	DF1510205	Film 0.001μF ±5% 50V
C119	DF1556205	Film 0.0056μF ±5% 50V
C120	DF1556205	Film 0.0056μF ±5% 50V
C121	DF1510205	Film 0.001μF ±5% 50V
C122	EA3350509	Electroly 3.3μF +100% -10 50V
C123	EA3350509	Electroly 3.3μF +100% -10 50V
C124	EA1050509	Electroly 1μF +100% -10 50V
C125	EA1050509	Electroly 1μF +100% -10 50V
C126	EA4740501	Electroly 0.47μF +150% -20 50V
C127	EA4740501	Electroly 0.47μF +150 -20% 50V
C128	EA4740501	Electroly 0.47μF +150% -20 50V
C129	EA4740501	Electroly 0.47μF +150% -20 50V
C130	DD1530102	Ceramic 300PF ±5% 50V
C131	DD1620101	Ceramic 200PF ±10% 50V
C132	DD1620101	Ceramic 200PF ±10% 50V
C133	DD1530102	Ceramic 300PF ±5% 50V
C134	EA4760509	Electroly 47μF +100% -10 50V
C135	EA4760509	Electroly 47μF +100% -10 50V
C136	EA4760509	Electroly 47μF +100% -10 50V
C137	EA4760509	Electroly 47μF +100% -10 50V
C138	DF1768301	Film 0.068μF ±20% 50V
C139	DF1768301	Film 0.068μF ±20% 50V
C140	DF1768301	Film 0.068μF ±20% 50V
C141	DF1768301	Film 0.068μF ±20% 50V

REF. DESIG.	MARANTZ PART NO.	DESCRIPTION
C142	EA2270359	Electroly 220μF +100% - 10% 35V
C201	DF1740301	Film 0.04μF ±20% 50V
C202	DF1740301	Film 0.04μF ±20% 50V
C203	DF1710301	Film 0.01μF ±20% 50V
C204	DF1710301	Film 0.01μF ±20% 50V
C205	EA4750359	Electroly 4.7μF +100% - 10% 35V
C206	EA4750359	Electroly 4.7μF +100% - 10% 35V
C207	EA1050509	Electroly 1μF +100% - 10% 50V
C208	EA1050509	Electrbly 1μF +100% - 10% 50V
C209	DD1650001	Ceramic 50PF ±10% 50V
C210	DD1650001	Ceramic 50PF ±10% 50V
C211	EA1070109	Electroly 100μF +100% - 10% 10V
C212	EA1070109	Electroly 100μF +100% - 10% 10V
C213	EA1050509	Electroly 1μF +100% - 10% 50V
C214	EA1050509	Electroly 1μF +100% - 10% 50V
C215	DF1768301	Film 0.068μF ±20% 50V
C316	DF1768301	Film 0.068μF ±20% 50V
C217	DF1768301	Film 0.068μF ±20% 50V
C218	DF1768301	Film 0.068μF ±20% 50V
C219	EA1050509	Electroly 1μF +100% - 10% 50V
C220	EA1050509	Electroly 1μF +100% - 10% 50V
C221	EA1050509	Electroly 1μF +100% - 10% 50V
C222	EA1050509	Electroly 1μF +100% - 10% 50V
C223	EA1050509	Electroly 1μF +100% - 10% 50V
C224	EA1050509	Electroly 1μF +100% - 10% 50V
C225	EA1050509	Electroly 1μF +100% - 10% 50V
C226	EA1050509	Electroly 1μF +100% - 10% 50V
C227	EA2270259	Electroly 220μF +100% - 10% 25V
		SEMICONDUCTORS
H101	HT310001E	Transistor 2SC1000GR
H102	HT310001E	Transistor 2SC1000GR
H103	HT310001E	Transistor 2SC1000GR

REF. DESIG.	MARANTZ PART NO.	DESCRIPTION
H104	HT310001E	Transistor 2SC1000GR
H105	HT310001E	Transistor 2SC1000GR
H106	HT310001E	Transistor 2SC1000GR
H107	HT310001E	Transistor 2SC1000GR
H108	HT310001E	Transistor 2SC1000GR
H109	HT310001F	Transistor 2SC1000BL
H110	HT310001F	Transistor 2SC1000BL
H111	HT310001F	Transistor 2SC1000BL
H112	HT310001F	Transistor 2SC1000BL
H113	HT310001F	Transistor 2SC1000BL
H114	HT104931B	Transistor 2SA493GR
H115	HT104931B	Transistor 2SA493GR
H116	HT104931B	Transistor 2SA493GR
H117	HT104931B	Transistor 2SA493GR
H201	HT307352X	Transistor 2SC735Y
H202	HT307352X	Transistor 2SC735Y
H203	HT307331D	Transistor 2SC733BL
H204	HT307331D	Transistor 2SC733BL
H205	HT307331D	Transistor 2SC733BL
H206	HT307331D	Transistor 2SC733BL
H207	HT307331D	Transistor 2SC733BL
H208	HT307331D	Transistor 2SC733BL
H209	HT307331C	Transistor 2SC733GR
H210	HT104941D	Transistor 2SA494GR
H211	HT307331C	Transistor 2SC733GR
H212	HT307331C	Transistor 2SC733GR
H213	HT104941D	Transistor 2SA494GR
H214	HT104941D	Transistor 2SA494GR
H215	HD2001105	Diode 1S1555
H216	DH2001105	Diode 1S1555
H217	HD2001105	Diode 1S1555
H218	DH2001105	Diode 1S1555
H219	HD2001105	Diode 1S1555
H220	HD2001105	Diode 1S1555
H221	HD2001105	Diode 1S1555
H222	HD2001105	Diode 1S1555
H223	HD2001105	Diode 1S1555
H224	HD2001105	Diode 1S1555
H225	HD2001105	Diode 1S1555
H226	HD2001105	Diode 1S1555
H227	HD2001105	Diode 1S1555
H228	HD2001105	Diode 1S1555
H229	HD3002809	Diode WZ-162
		MISCELLANEOUS
0110	285725901	Bush
0117	51100308S	B.H.M. Screw
0118	53110303E	Hexagon Nut
0119	54020301E	Flat Washer
0120	59030808P	Washer

REF. DESIG.	MARANTZ PART NO.	DESCRIPTION
0125	51102606S	B.H.M. Screw
*	285706440	Cabinet Case Ass'y Incl. A.B.
A	285706441	Case Cover Ass'y
0102	285706401	Case
0106	285720301	Name Plate

REF. DESIG.	MARANTZ PART NO.	DESCRIPTION
B	285706442	Bottom Case Ass'y
0103	285706402	Case
0107	285726501	Indicator
0113	285712001	Insulator

7. TECHNICAL SPECIFICATIONS

Frequency Response at 100Hz, 1KHz, and 10KHz (ref. 150mV)

LF channel (L_T = 0dB input)	0 ± 1dB
RF channel (R_T = 0dB input)	0 ± 1dB
LR channel ($L_T = R_T(-90°) = -3$dB input)	0 ± 1dB
RR channel ($L_T = R_T(+90°) = -3$dB input)	0 ± 1dB

Harmonic Distortion at 1KHz

LF and RF channels ($L_T = R_T$ = 1V)	≤0.05%
LR and RR channels ($L_T = -R_T$ = 1V)	≤0.05%

Logic characteristics at 1KHz (ref. input signal level)

$L_T = R_T$ = 20mV input	0 ± 1dB (LF and RF)
	≤−7dB (LR and RR)
$L_T = R_T$ = 1V input	0 ± 1dB (LF and RF)
	≤−8dB (LR and RR)
$L_T = -R_T$ = 20mV input	≤−6dB (LF and RF)
	0 ± 1dB (LR and RR)
$L_T = -R_T$ = 1V input	≤−8dB (LF and RF)
	0 ± 1dB (LR and RR)

Shorted Input Hum and Noise ..... ≤0.5mV

GENERAL

Current Drain at no signal ..... ≤50mA

Dimensions

Width	6-11/32 Inches
Height	1-9/64 Inches
Depth	4-3/8 Inches
Weight	0.7 lbs.

*These specifications and exterior designs may be changed for improvement without advance notice.